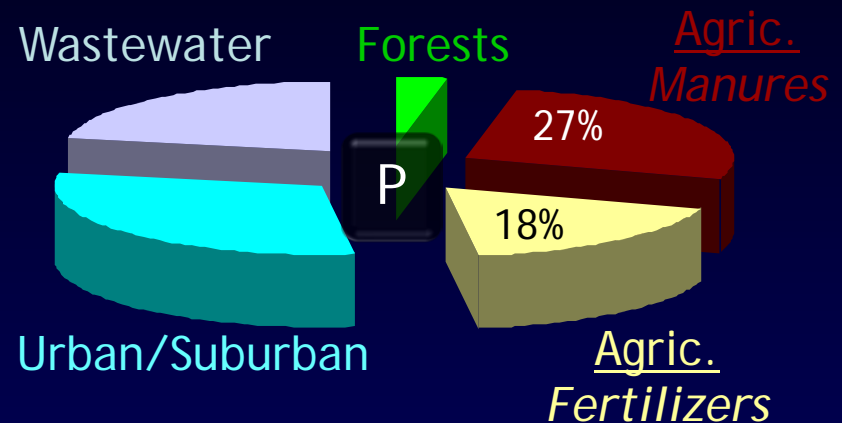


# Phosphorus Management in the Chesapeake Bay Watershed

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# 2009 Executive Order 13508 2011 Chesapeake Bay TMDL



TMDL goal – 15 million lbs P/yr

92 TMDLs

44,000 farms

17 million people

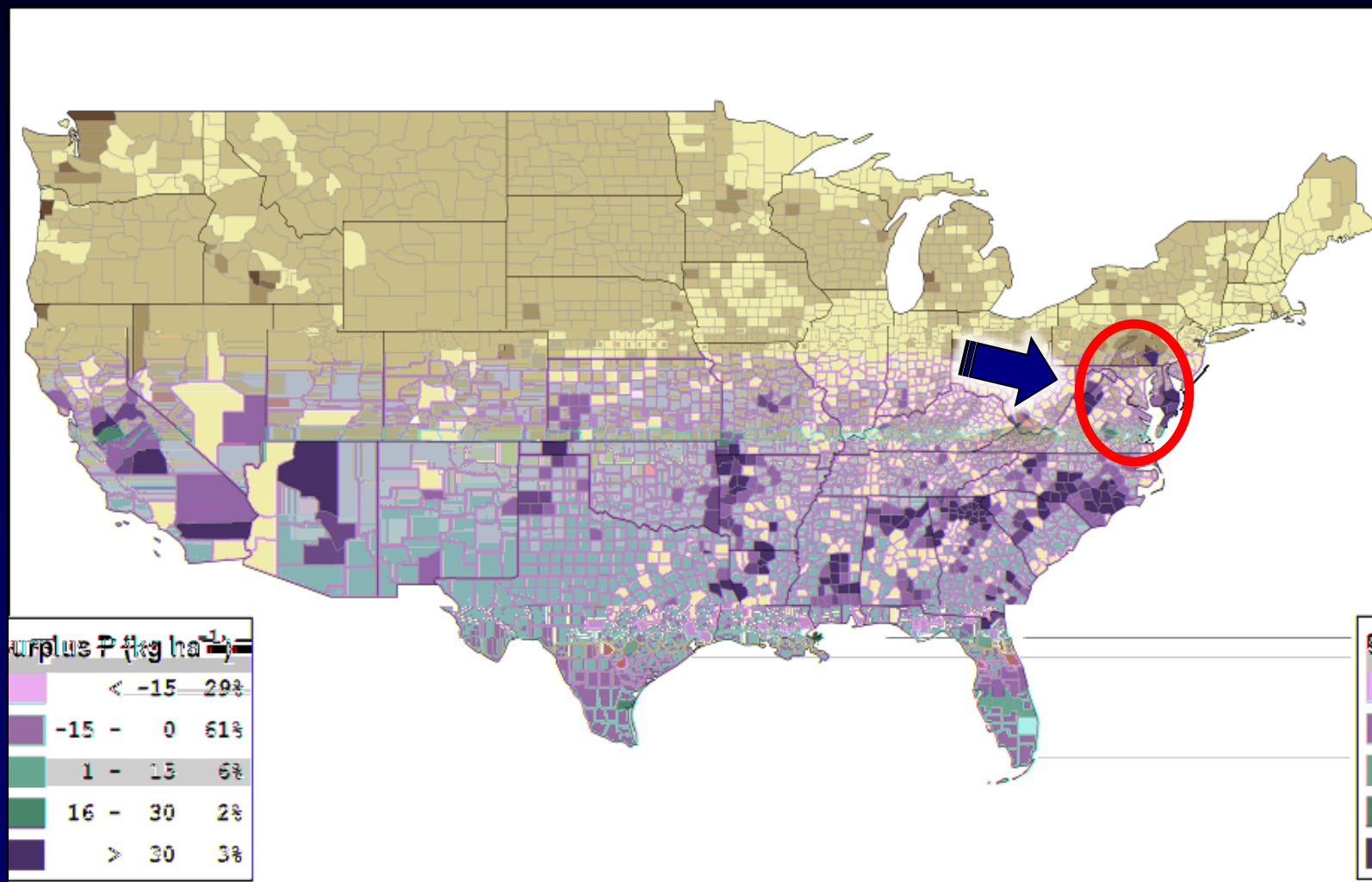
483 treatment plants

\$2.36 billion federal funds to 2011

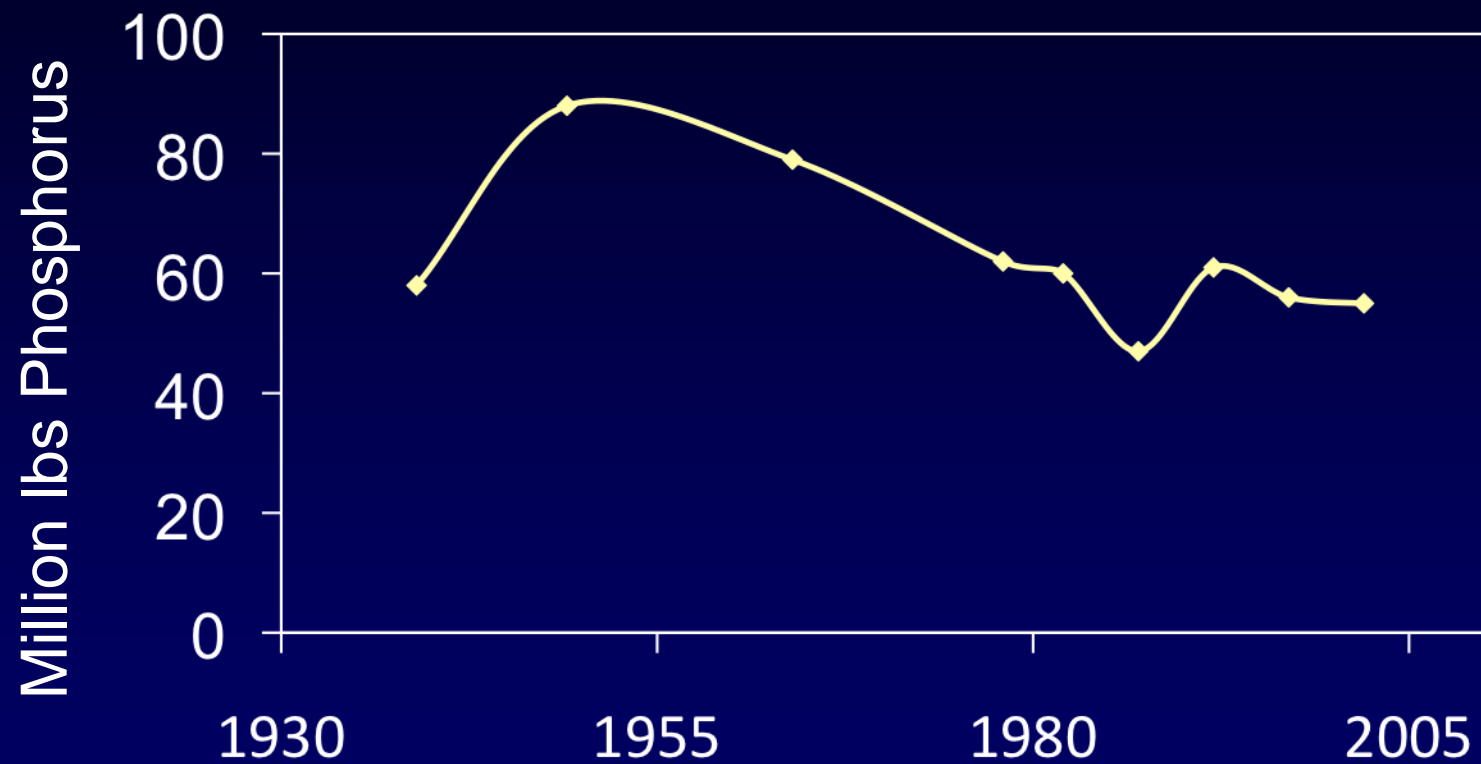
64,000 sq-miles

# Long term causes

## *Regional nutrient imbalance*



## Pennsylvania cropland P balance 1939-2002





# The Beaver Stadium

*108,000 Nittany Lion fans*

100,000,000 gallons = 378,000,000 liters

# Chesapeake Bay Watershed -

Livestock  
(1.7 million au)  
44 million tons  
manure

100 Beaver stadiums

14 million humans  
4 million tons

Manure export = P export

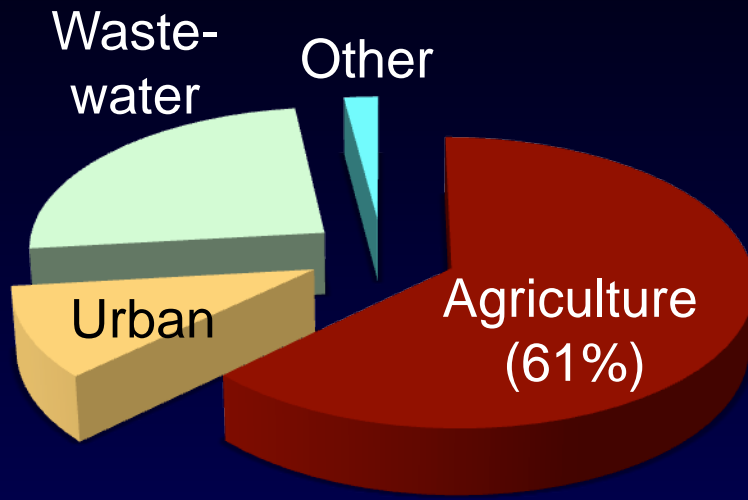
Delmarva litter  
pelletizing plant

Dane County  
Wisconsin  
manure digester

Minnesota turkey  
litter power plant

Arkansas poultry  
litter baling

## Benefit - agricultural BMPs



Expected P reductions






## Casualty – Nutrient Management Planning

### *Chesapeake Bay Guidance for Federal Land Management*

1. Replace P Index with soil environmental threshold ( soil P saturation)
  - > 20% Psat, no added P
  - <20% Psat, up to N-basis
  - If Psat ↑, P-basis
2. Need other tools to deal with hydrology, including re-implementing P Index.





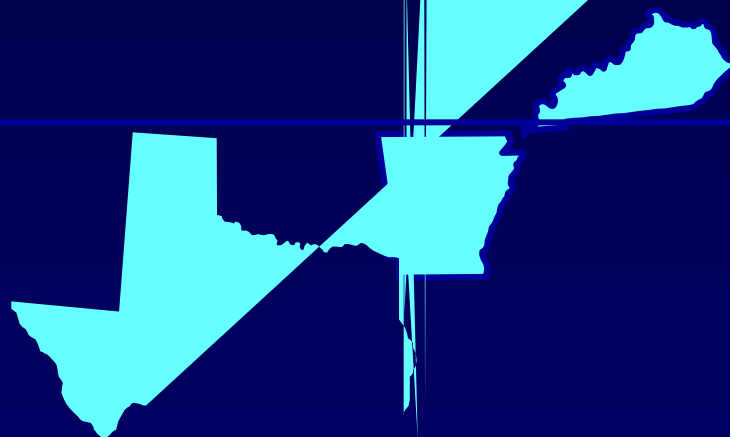
## Nutrient Management Planning – 1999 NRCS Uniform Strategy

### *Field Management of P*

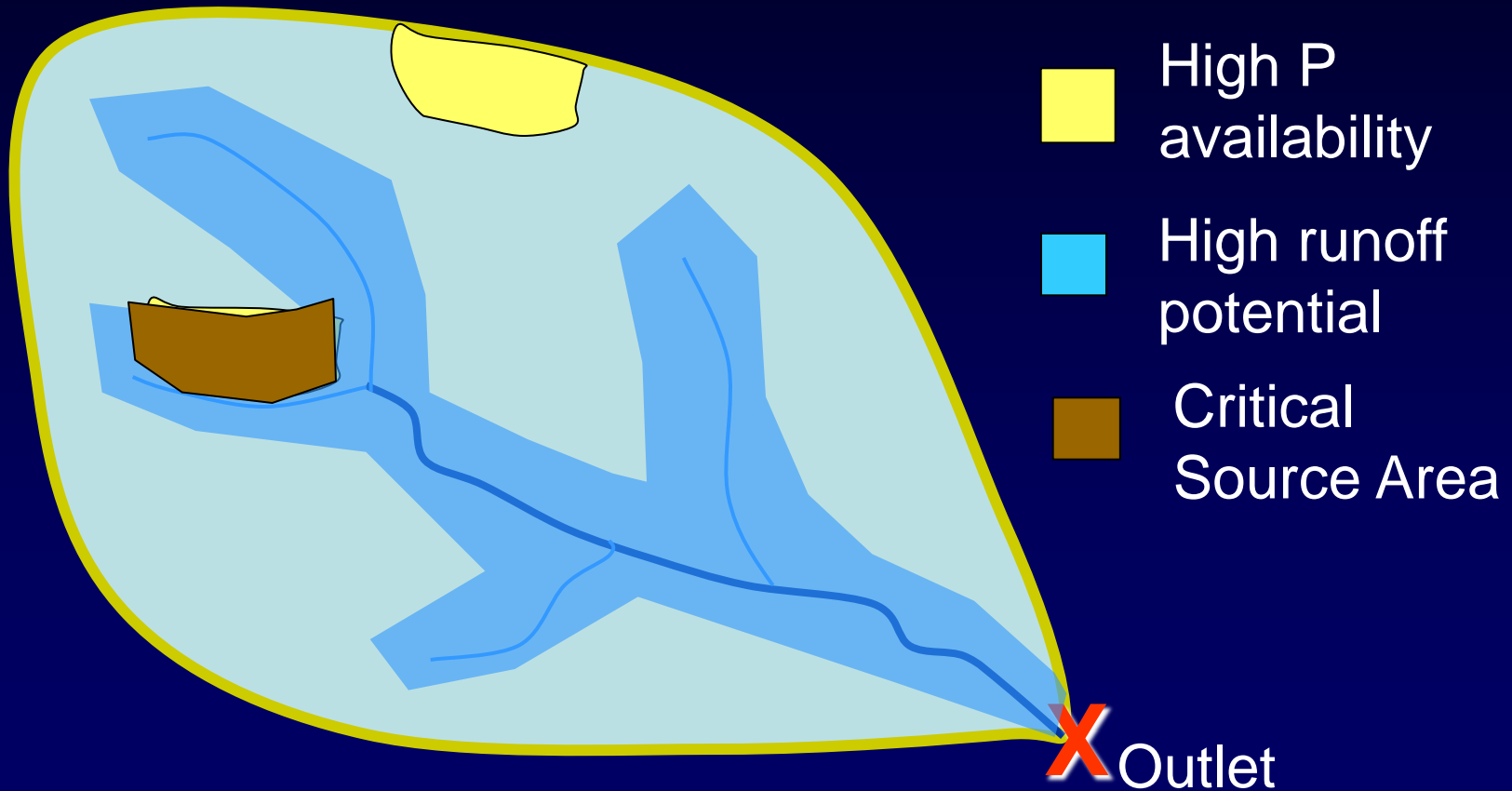
1. Soil threshold – agronomic
2. Soil threshold – environmental
3. Site assessment tool – P Index



-  P Index
-  Soil P Threshold



## P Index – Identifies Critical Source Areas



# P Index – Identifies Critical Source Areas

## The Pennsylvania Phosphorus Index

**Version 2**

### PART A: Screening Tool

	CMU/Field ID				
Is the CMU/field in a special protection watershed?					

# P Index – Identifies Critical Source Areas

## Site Conditions

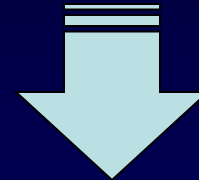
### *Source*

- Soil P
- Manure (rate, method, timing)
- Fertilizer (rate, methods, timing)

### *Transport*

- Runoff
- Erosion
- Leaching

## Site Rating

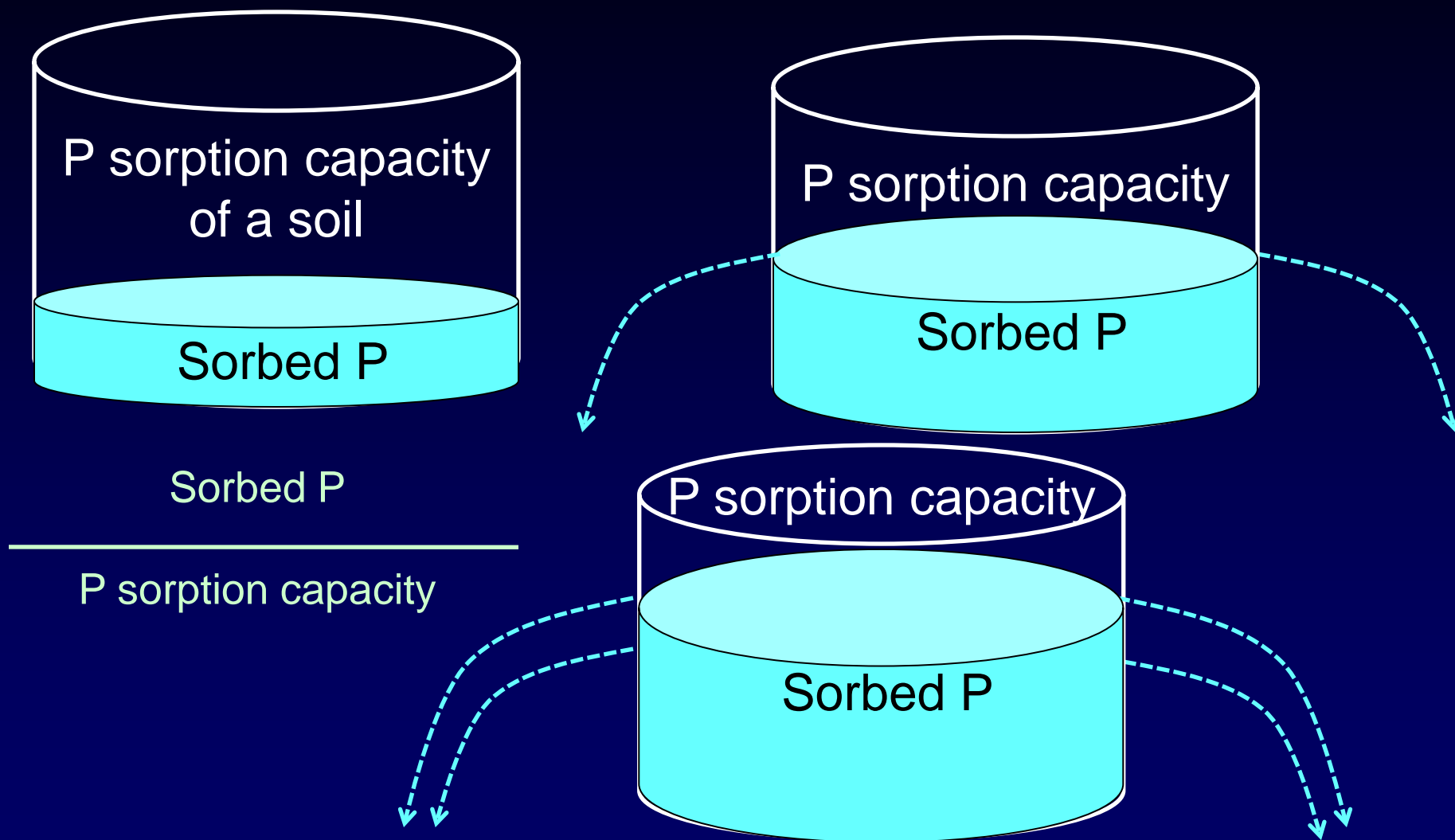


## Management recommendation

Table 2. Phosphorus index management guidance.

Value	Rating	Management Guidance
0 to 59	Low	Nutrients can be applied to meet the nitrogen crop requirement. Low potential for P loss. Maintenance of current farming practices is recommended to minimize the risk of adverse impacts on surface waters.
60 to 79	Medium	Nutrients can be applied to meet the nitrogen crop requirement. Medium potential for P loss. The chance for adverse impacts on surface waters exists. An assessment of current farm nutrient management and conservation practices is recommended to minimize the risk of future P loss.
80 to 99	High	Nutrients can be applied to meet the phosphorus crop removal. High potential for P loss and adverse impacts on surface waters. Soil and water conservation measures and P-based management plans are needed to minimize the risk of P loss.
100 or	Very High	No phosphorus can be applied. Very high potential for P loss and greater adverse impacts on surface waters. Conservation measures and a P-based management plan must be implemented to minimize the P loss.

## Soil P saturation – Indicator of runoff P



## Soil P saturation – soil indicator only

Total P

8 kg/ha/yr

<1 kg/ha/yr

1 kg/ha/yr

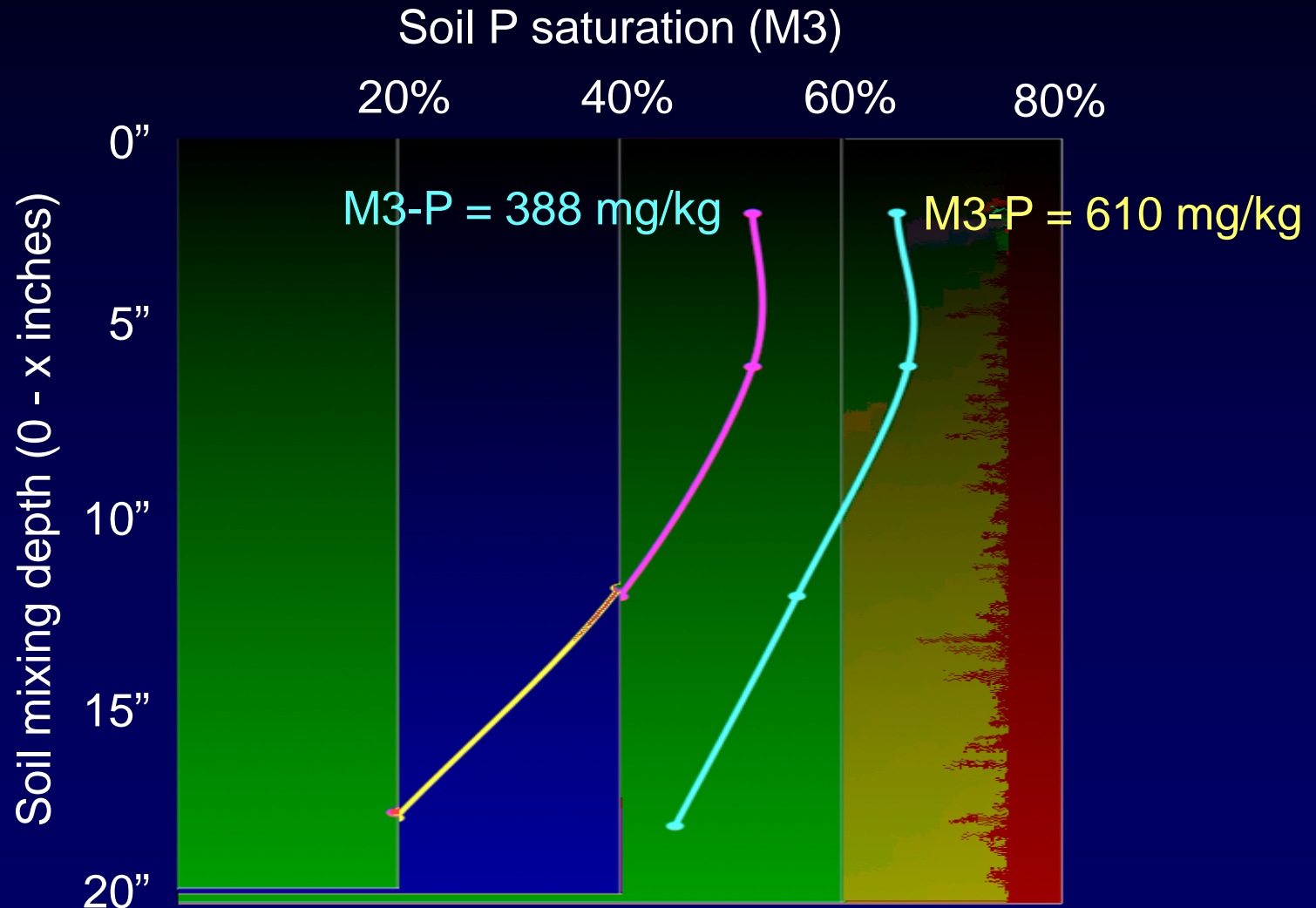
Psat = 21%

Psat = 17%

Psat = 9%



## Soil P saturation – manipulated by tillage/sampling depth



*Delmarva soils – long history of litter application*



## P Management Future

1. More stringent field restrictions
2. Regional manure management
  - Chesapeake P Index?
  - Manure transport/export
3. Improved representation of hydrology/transport
  - Leaching
  - Forecasting
  - Erosion – LiDAR DEMs
4. Dedicated practices
  - Legacy P

# THANK YOU